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(For IMIX-XS)
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DRAMIX® STEEL FIBERS
 (Note: 3D 65/60BG steel fibers only are also marketed by Irving Materials, Inc. under the name of IMIX-XS)

CSI Sections:

- 03 20 00 – Concrete Reinforcement
- 03 24 00 – Fibrous Reinforcing
- 03 30 00 – Cast-in-Place Concrete
- 03 40 00 – Precast Concrete
- 03 70 00 – Mass Concrete
- 05 31 00 – Steel Decking

1.0 RECOGNITION

Dramix® and IMIX-XS steel fibers described in this report have been evaluated for use as an alternative or as a supplement to, the conventional concrete reinforcement specified by ACI 318, ACI 360, SDI-C, or for other applications included in this report. The use shall be permitted as defined and limited by the scope of this report. In addition, Dramix® steel fibers have been evaluated for use in structural plain (unreinforced) concrete footings, structural plain concrete slabs supported directly on the ground, other structural plain concrete structures designed according to Chapter 14 of ACI 318-14 (Chapter 22 of ACI 318-11 and 318-08), plain concrete applications, and reinforcement within the scope of ACI 360-10 Section 9.3.2. Other applications where the Dramix® steel fibers have been added solely as shrinkage and temperature reinforcement are permitted. Additionally, uses relative to the requirements of SDI C-2011 Section 2.4.A.13.a.1 or SDI C-2017 Section 2.4.B.15.a.1, as applicable, are described in Section 3.2.1.3 of this report. The strength properties were evaluated for compliance with the following codes:

- 2018, 2015, 2012, and 2009 International Building Code® (IBC)
- 2018, 2015, 2012, and 2009 International Residential Code® (IRC)
- 2019 California Building Code (CBC) – Attached Supplement
- 2019 California Residential Code (CRC) – Attached Supplement
- 2020 Florida Building Code, Building (FBC, Building) – Attached Supplement
- 2020 Florida Building Code, Residential (FBC, Residential) – Attached Supplement
- 2014 New York City Building Code (NYCBC) – Attached Supplement

2.0 LIMITATIONS

Use of the Dramix® (IMIX-XS) steel fibers recognized in this report is subject to the following limitations:

2.1 The scope of the report is limited to the following specific Dramix® fiber models: 3D 45/30GG, 3D 45/35BL, 3D 45/50BL, 3D 55/30BG, 3D 55/90BG, 3D 55/60BL, 3D 65/35BG, 3D 65/35GG, 3D 65/40GG, 3D 65/60BG, 3D 65/60GG, 3D 80/50BG, 3D 80/60BG, 3D 80/60GG, 4D 55/60BG, 4D 65/35BG, 4D 65/60BG, 4D 80/60BG, 5D 65/60BG, and 5D 65/60GG.

2.2 Design and construction of concrete utilizing the Dramix® steel fibers shall be in accordance with the requirements of Section 3.0 of this report and the codes and standards referenced therein.

2.3 The use of the Dramix® steel fibers in Seismic Force Resisting Systems shall be considered in accordance with Section A1 of Annex A of this report.

2.4 The use of the Dramix® steel fibers in normal-weight and lightweight concrete shall be permitted, except as otherwise restricted by Section 3.0 of this report and the codes and standards referenced therein.

2.5 When structural plain concrete is used, it shall comply with Section 1906 of the IBC. When structural plain concrete is supported directly on the ground, control joints shall be provided as required by ACI 318-14 Section 14.3.4 (Section 22.3 of ACI 318-11 and -08).

2.6 Use of Dramix® steel fibers shall be as approved by a registered design professional.



2.7 When conventional reinforcement is required for structural design, such reinforcement shall be provided as required by the project documents as prepared by the registered design professional.

2.8 When steel Dramix® steel fibers are added at the ready-mix plant, a batch ticket, signed by a ready-mix representative, shall be available to the building official upon request. The delivery ticket shall include, in addition to the items noted in ASTM C94, the type and amount of Dramix® steel fibers added to the concrete mix. Other requirements relative to fiber inclusion into the concrete matrix and the related quality assurance provisions shall be as stipulated by Section 3.0 of this report.

2.9 Fire-resistance rating properties of Dramix® steel fibers are beyond the scope of this report except as provided by this section. The steel fibers are permitted to be used as a component of a fire-resistance-rated assembly in accordance with IBC Section 703.2, based on testing in accordance with ASTM E119 or UL 263. Alternative methods in IBC Section 703.3 are also permitted. Fire-resistance based on testing in accordance with ASTM E119 or UL 263 may be established when the registered design professional specifies, and then the building official approves a fire-resistance-rated assembly, listing the specific Dramix® steel fiber models, from the Underwriters Laboratories Online Certifications Directory.

2.10 Dramix® 3D 45/30GG, 3D 45/35BL, 3D 45/50BL, 3D 55/30BG, 3D 55/60BG, 3D 55/60BL, 3D 65/35BG, 3D 65/35GG, 3D 65/40GG, 3D 65/60BG (a.k.a. IMIX-XS when marketed by Irving Materials, Inc.), 3D 65/60GG, 3D 80/50BG, 3D 80/60BG, 3D 80/60GG, 4D 55/60BG, 4D 65/35BG, 4D 65/60BG, 4D 80/60BG, 5D 65/60BG, and 5D 65/60GG steel fibers are manufactured by Bekaert Corporation's parent company NV Bekaert SA at its manufacturing facility in Petrovice, Czech Republic.

3.0 PRODUCT USE

3.1 General: Dramix® (IMIX-XS) fiber models enumerated in Section 4.0 of this report are used as an alternative to the conventional reinforcement, either as partial or full replacement thereof, subject to the stated limitations. The reinforcement replacement, within the scope of this report, shall be permitted for structural and non-structural applications with the structural and non-structural members, respectively, designed and constructed in accordance with ACI 318, SDI-C, and ACI 360.

3.2 Design:

3.2.1 Design Scope: The design scope shall be as defined and limited by Section A1 of Annex A of this report.

3.2.2 Nominal Material Properties: Nominal material properties used in the design for strength and serviceability shall be as defined in Section A3 of Annex A of this report.

3.2.3 Determination of Required Strength, Member, and Section Design Strength: Required and design strengths of members and sections, as applicable, shall be determined in accordance with Section A4 of Annex A of this report.

3.2.4 Applications Specific Requirements: Structural and non-structural systems consisting of members, elements, and sections shall be configured in accordance with Section A5 of Annex A of this report.

3.2.5 Serviceability: Structural and non-structural systems' serviceability shall be considered in accordance with Section A6 of Annex A of this report.

3.2.6 Durability of Members and Systems: Structural and non-structural system durability shall be considered in accordance with Section A8 of Annex A of this report.

3.3 Installation: The manufacturer's published installation instructions for Dramix® steel fibers and this report shall be strictly adhered to at all times on the job site during installation. If there are any conflicts between this report and the manufacturer's published installation instructions, the more restrictive shall govern. Concrete with steel fibers shall comply with ASTM C1116, Type I. Dramix® fibers may be added to the concrete at the ready-mix plant or the job site. Furthermore, Sections A7 and A9 of Annex A of this report shall apply.

3.4 Quality Assurance: The manufacturer's published quality assurance specifications for Dramix® and Section A7 of Annex A of this report shall be adhered to.

4.0 PRODUCT DESCRIPTION

Dramix® (IMIX-XS) fibers are cold-drawn, hooked wire fibers with end anchors complying with the requirements of ASTM A820, Type I. The fibers are delivered either in loose form or as glued clips. Dramix® 3D series fibers are manufactured from non-alloy steel rods complying with ISO 16120-2, Grade C9D. Dramix® 4D fibers are manufactured from non-alloy steel rods complying with ISO 16120-2, Grades C15D-C20D. Dramix® 5D fibers are manufactured from high-carbon steel rods complying with ISO 16120-2, Grades C78D-C86D. Dimensions for each fiber model are provided in Table 1 of this report.

Galvanized Dramix® steel fibers contain a minimum 0.098 oz/ft² (30 g/m²) zinc coating. In a Dramix® steel fiber model designation TD UV/WX YZ, Y= G when the wire is galvanized, and Y=B when the wire is bright. Z= G when the fibers are delivered in glued form, and Z= L when the fibers



are loose. The letter T is a designator reflecting the number of straight wire segments in the end-anchor configuration. UV designation is indicative of the aspect ratio of the product based on the length of the product. WX is indicative of the length of the product.

Dramix® fibers are packaged in in 33-pound (15 kg) or 44.1-pound (20 kg), non-water-soluble bags; or 2,450-pound (1100 kg) bags. The glued Dramix® steel fibers are adhered in clips and separated into individual elements when added to the concrete mix.

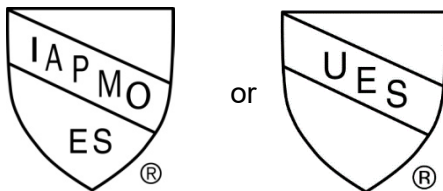
TABLE 1 – Dramix® Steel Fiber Dimensions

Fiber Model	Length (mm)	Diameter (mm)
3D 45/30GG	30	0.62
3D 45/35BL	35	0.75
3D 45/50BL	50	1.05
3D 55/30BG	30	0.55
3D 55/60BG, BL	60	1.05
3D 65/35BG, GG	35	0.55
3D 65/40GG	41	0.62
3D 65/60BG, GG	60	0.90
3D 80/50BG	50	0.62
3D 80/60BG, GG	60	0.75
4D 55/60BG	61	1.05
4D 65/35BG	36	0.55
4D 65/60BG	61	0.90
4D 80/60BG	61	0.75
5D 65/60BG, GG	62	0.90

Note: For dimensions in inches, the values from Table 1 shall be divided by 25.4 mm/in.

5.0 IDENTIFICATION

Dramix® steel fiber packaging is identified by the Bekaert Corporation name (the Irving materials name is also included when marketed as IMIX-XS) and trademark, product name, including Dramix® or IMIX-XS steel fibers, manufacturing location, and the evaluation report number (ER-465). Either Mark of Conformity may also be used as shown below:



IAPMO UES ER-465

6.0 SUBSTANTIATING DATA

6.1 Manufacturer's descriptive literature and installation instructions. Test reports are from laboratories in compliance with ISO/IEC 17025.

6.2 Data in accordance with the Evaluation Criteria for Anchored Steel Fibers in Concrete (IAPMO UES EC 026), adopted December 2018, editorially revised in January 2019.

6.3 Dimensional and mechanical property test data in accordance with ASTM A820.

6.4 Flexural performance testing in accordance with ASTM C1609 and EN14651.

6.5 References are listed in Section A2.1 of Annex A of this report.

6.6 Freeze and thaw durability testing in accordance with ASTM C666.

7.0 STATEMENT OF RECOGNITION

This evaluation report describes the results of research completed by IAPMO Uniform Evaluation Service on Dramix® and IMIX-XS steel fibers to assess the conformance to the codes shown in Section 1.0 of this report and documents the product's certification. Products are manufactured at locations noted in Section 2.10 of this report under a quality control program with periodic inspection under the supervision of IAPMO UES.

For additional information about this evaluation report please visit www.uniform-es.org or email at info@uniform-es.org



FLORIDA SUPPLEMENT

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1.0 RECOGNITION

The Dramix® and IMIX-XS steel fibers evaluated in IAPMO UES ER-465 are satisfactory alternatives to the steel fiber reinforcing prescribed in the following codes and regulations, subject to the additional limitations in Section 2.0 of this supplement:

- 2020 Florida Building Code, Building (FBC, Building)
- 2020 Florida Building Code, Residential (FBC, Residential)

2.0 LIMITATIONS

Use of the Bekaert Corporation Dramix® and IMIX-XS steel fibers recognized in ER-465 and this report supplement is subject to the following limitations.

2.1 Dramix® and IMIX-XS steel fibers shall comply with the provisions applicable to the 2018 IBC or 2018 IRC in IAPMO UES ER-465.

2.2 Verification shall be provided that a quality assurance agency audits the manufacturer's quality assurance program and audits the production quality of products, in accordance with Section (5)(d) of Florida Rule 61G20-3.008. The quality assurance agency shall be approved by the Commission (or the building official when the report holder does not possess an approval from the Commission).

2.3 The requirements for High-velocity Hurricane Zones (HVHZ) in the Florida Building Code, Building and the Florida Building Code, Residential are beyond the scope of this review.

2.4 This supplement expires concurrently with ER-465.

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CALIFORNIA SUPPLEMENT

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1.0 RECOGNITION

The Dramix® and IMIX-XS steel fibers evaluated in IAPMO UES ER-465 are satisfactory alternatives to the steel fiber reinforcing prescribed in the following codes, subject to the additional limitations in Section 2.0 of this supplement:

- 2019 California Building Code (CBC)
- 2019 California Residential Code (CRC)

2.0 LIMITATIONS

Use of the Dramix® and IMIX-XS steel fibers recognized in ER-465 and this report supplement is subject to the following limitations:

2.1 Dramix® and IMIX-XS steel fibers shall comply with the provisions applicable to the 2018 IBC or 2018 IRC in IAPMO UES ER-465.

2.2 Except as permitted under Section 2.3 of this report, the use of steel fiber reinforcement shall not be permitted in structures regulated by the Division of the State Architect-Structural Safety (DSA-SS), and in applications regulated by the Department of Health Care Access and Information (HCAi, formerly OSHPD) in accordance with Sections 1903.7, 1909.2.2, and 1903A.7 of the CBC.

2.3 The use of steel fiber reinforcement is permitted for use with concrete-filled steel deck in structures regulated by the Division of the State Architect-Structural Safety (DSA-SS), and in applications regulated by the Department of Health Care Access and Information (HCAi), in accordance with Section 2210A.1.1.3 of the CBC.

2.4 In applications regulated by DSA-SS and HCAi, inspections shall comply with Chapter 17A of the CBC.

2.5 This supplement expires concurrently with ER-465.

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CITY OF NEW YORK SUPPLEMENT

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1.0 RECOGNITION

The Dramix® and IMIX-XS steel fibers evaluated in IAPMO UES ER-465 are satisfactory alternatives to the steel fibers prescribed in the following code, subject to the additional requirements in Section 2.0 of this supplement:

- 2014 New York City Building Code (NYCBC)

2.0 LIMITATIONS

Use of the Dramix® and IMIX-XS steel fibers recognized in ER-465 and this report supplement is subject to the following limitations:

2.1 Dramix® and IMIX-XS steel fibers shall comply with the provisions applicable to the 2009 IBC or 2009 IRC in IAPMO UES ER-465.

2.2 The performance of the mix design shall be confirmed when using steel fibers in accordance with Section 1905.3.5.2 of the NYCBC.

2.3 Unless used in the application of the provision of ACI 318-11 Sec. 11.4.6.1(f) or 318-14/19 Sec. 9.6.3.1, steel fibers used in beams need not comply with the requirements of Section 1905.6.6 of the NYCBC, except that special inspection requirements shall apply.

2.4 This supplement expires concurrently with ER-465.

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